Notes on Question 3: EPA Estuarine Habitat Workshop

3/27/12

3(a): Drivers in the quantity of estuarine habitat during each season of the year?

Issues/Assumptions

1. "Habitat"--Focus on Low Salinity Zone (1-6 ppt) as "habitat". Note, however, that this is based on averaging, both spatially and temporally. There is obviously more variation.
2. "Quantity"—Focus will be on area and areal extent.
3. There is much more certainty about the drivers (below); however, processes are likely much more important to organisms and are much less well understood.
4. The first three drivers below are generally the most important.
5. Spatial gradients vary depending on where the LSZ along the gradient of the estuary.
6. The responses to drivers will vary by the type of species . For example, benthic organism responses are different because they occupy more "fixed" locations.
7. The group struggled with the separation of "quantity" and "quality"—both are obviously important and interrelated.
8. Except where indicated, most drivers apply to all seasons.

Drivers

1. Flow
    a. Rivers, watershed, local tributaries.
    b. Lots of variability in this factor.
    c. Need to consider component parts:
        i. Inflow
        ii. Outlfow
        iii. Exports
    d. The previous components of flow are affected by multiple factors including:
        i. Flood management.
        ii. Flow and temperature requirements.
        iii. Water demand.
    e. The previous components and factors all vary by season.
2. Landscape, bathymetry, and geography.
    a. The effect of landscape has been relatively underappreciated until recently.
3. Tides
    a. Strong effects of the spring-neap cycle.
4. Wind
5. Barometric pressure

    a. Often linked to wind.
6. Water control structures
    a. Example: Salinity control gates.
    b. Highly seasonal operations.
7. Antecedent conditions.
    a. What happened in previous months and seasons can affect outcomes.

Question 3(b): Drivers in the quality of estuarine habitat during each season of the year?

Issues/Assumptions

1. "Quality" will be assumed to apply to biota.
2. Focus is on LSZ

Physical Drivers

1. Depth
2. Turbidity
3. Salinity variation (Some disagreement about the relevance of this factor given the other drivers listed below).
4. Vertical stratification
5. Vertical shear
6. Lateral shear
7. Temperature
8. Connectivity
    a. Examples include:
        i. Channel & off channel areas.
        ii. Marsh channels to main channels.
        iii. Marshplains and channels.
        iv. Channels and adjacent bays.
9. Residence time
10. Light availability
11. Structures
    a. Examples include:
        i. Piles
        ii. Mothball fleet
        iii. Marinas
        iv. Riprap
12. Substrates
13. Diversions (Entrainment risk)
    a. Example: Contra Costa power plant
14. Salinity control structures

a. Gates

Biological Drivers

1. Food availability
    a. Phytoplankton
        i. Biomass
        ii. Composition
    b. Zooplankton
        i. Biomass
        ii. Composition
    c. Microzooplankton
        i. Biomass
        ii. Composition
    d. Macroinvertebrates
        i. Biomass
        ii. Composition
    e. Bioavailable carbon
        i. Quantity
        ii. Composition
2. Predation Risk
    a. Upwelling zones
    b. Shear zones.
    c. Structures
    d. Jellyfish
    e. Birds
    f. Sea lions
3. Competitors
    a. Jellyfish
    b. Benthos
        i. Filtering rates may be a useful metric.
4. SAV
    a. Native vs invasive.
5. FAV
    a. Example: Hyacynths
6. Harvest
    a. Recreational
    b. Poaching
7. Wetland plants

Chemical Drivers

1. Nutrient concentrations/ratios.

2. Contaminants
3. DO
4. **pH**

3(c): Biological indicators that respond to changing locations of the LSZ east of the Carquinez Strait?

Issues/Assumptions

1. Focus is on factors that change in response to LSZ position, NOT on all possible things that could be measured.
2. Distinction between "things that respond" and "things that are associated".
3. Focus on biota
    a. Minority opinion suggested broadening metrics to other important factors such as turbidity and temperature.
4. Historical record doesn't include full range of conditions to fully evaluate this issue.
5. There long term data set is limited by the frequency and timescales of the data.
6. Many metrics are supported by actual data. Several metrics are associated with a high degree of uncertainty, but are nonetheless plausible.

Metrics

Benthos

1. Corbicula
    a. Density
    b. Biomass
2. Corbula
    a. Density
    b. Biomass

Food

1. Phytoplankton
    a. Distribution (broad scale/fine scale)
    b. Availability (uncertainty about actual degree of response)
    c. Composition (ditto)
    d. Net productivity (ditto)
    e. Patchiness.
2. Zooplankton.
    a. Ditto to above.
3. Harmful algal bloom occurrence.
    a. Distribution
    b. Density.

Fish and Macroinvertebrates

1. Delta smelt
    a. Abundance (controversial)
    b. Distribution
    c. Health and condition (uncertainty)
2. Longfin smelt
    a. Abundance
    b. Distribution
    c. Health and condition
3. American shad
    a. Distribution
    b. Abundance
4. Splittail
    a. Ditto
5. Starry flounder
    a. Abundance
6. White sturgeon
    a. Distribution (uncertainty)
    b. Abundance (uncertainty)
7. Fish community composition
8. Neomysis
    a. Abundance (uncertainty)
    b. Distribution
9. Crangon
    a. Abundance
    b. Distribution

Other Metrics

1. Predation rates (uncertainty)
2. Wetland plant diversity
3. Scoter and scaup distribution